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A Policy Brief: Climate Change and Epidemiology Type of Manuscript: Commentary

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Endorsements

American College of Epidemiology (ACE) Australasian

Epidemiological Association (AEA) Brazilian

Association of Public Health (ABRASCO)

Canadian Society for Epidemiology and Biostatistics (CSEB)

Collegium Ramazzini (CR)

European Society for Environmental and Occupational Medicine (EOM)

International Society for Children's Health and the Environment (ISCHE)

International Society for Environmental Epidemiology (ISEE) International

Society for Pharmacoepidemiology (ISPE)

National Association of County & City Health Officials – Epidemiology Workgroup (NACCHO)

Romanian Society of Epidemiology (RSE)

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Spanish Society of Epidemiology (SEE)

Society for the Analyses of African American Public Health Issues (SAAPHI)

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Introduction

Climate change is well documented through fluctuations in average annual global temperature, the frequency and severity of extremes in temperature and precipitation, and other weather-related phenomena. While evidence for the continuing and growing public health impact of climate change on communities around the world accumulates, funding agencies and policy-makers provide limited support for epidemiological studies that may inform effective interventions to reduce the short- and long-term public health consequences of climate change.

This Policy Brief encourages policy-makers to work with epidemiologists to allow its contribution at different stages of the policy cycle. There is an urgent need for evidence-based policies that efficiently focus resources and better protect communities against risk factors. This is essential if morbidity and mortality associated with climate change are to be minimized.

We also urge epidemiologists to collaborate with researchers in the fields of meteorology and climatology, environmental and social sciences, urban planning, disaster relief, and economics, to develop systems-based methods and approaches to manage existing and emerging climate- sensitive health risks. New approaches are needed to consider and quantify different aspects of climate change as an exposure risk factor that can only be identified as a risk factor over periods of years and decades.

Why is climate change a public health concern?

Climate change is already affecting population health, with projected risks rising as the climate continues to change. Risks relate to all aspects of life, including impacts related to extreme weather events, undernutrition, malaria and other vector-borne diseases, diarrheal and

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other waterborne diseases, and heat stress. Extreme weather and climate events are also a risk factor for non- communicable diseases [1].

Climate change is increasing the geographic range, seasonality, and intensity of transmission of diseases such as Lyme disease, dengue, malaria, West Nile virus, and *Vibrio* infections. In addition, indirect health impacts arise through warming oceans leading to changes in ocean dynamics, release of accumulated toxins, acidification, and the ecologic life cycle of marine life, eventually affecting the food chain that impacts food security for those who depend on such sources for their livelihoods [2]. The direct costs to health (i.e., excluding costs in health-determining sectors such as agriculture, water, and sanitation), will be in the billions of US dollars by 2030 [3].

Climate change interacts with other health determinants and with other systems. The health of humans is an inseparable part of the environment of the planet and these systems are undergoing potentially irreparable change in the direction of no longer being able to sustain life as we know it. For example, flooding, as a result of increase in precipitation or melting glaciers as part of climate change, can be associated with sewage overflows, emergence of water-borne diseases, food-borne diseases, blue-green algae, and disruption of agriculture, electricity, transportation, and other aspects of human life. Similarly, severe drought can affect the livelihood of farmers, access to clean water, food prices, and soil contaminants. The most vulnerable in society are at highest risk. Low-income countries that have contributed the least to anthropogenic climate change are the countries most affected because they have inadequate buffering capacities against extreme environmental conditions.

While the framework of how climate change affects health is well known, a full understanding and

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quantification of the magnitude and pattern of risks from climate change, and how they are likely to change over the coming years, is insufficient. Research methods and data collection systems involving epidemiology and other scientific disciplines need to be further developed beyond traditional methods to reduce uncertainties [4]. As emphasized in a recent commentary[5], understanding and quantifying the complex relationships between climate change and health would "*help society to better prepare for and adapt to the impacts of climate change, actions that can produce major health benefits independent of effects on the environment*". Further, understanding is needed of the health co-benefits of mitigation policies and technologies, to provide evidence for the extent to which mitigation can promote and protect population health [6].

Critique of current policy regarding climate change

Policymakers are now considering the short-term individual- and community-level health impacts of climate change. For example, although policies targeting climate change are often focused on long-term greenhouse gas emission mitigation to decrease CO2, there is increasing interest in how these policies could impact public health. Long-term mitigation strategies such as energy and water conservation, renewable and alternative energy usage, and agriculture and built-environment approaches will ultimately improve overall human health and well-being. Epidemiologic research is starting to provide essential input for evaluating such strategies before implementation, but much more focus and effort are needed.

Financial support for evaluating the impact of mitigation strategies on the health of populations is limited compared to other areas of research [7]. There is a need for comprehensive epidemiological studies that would help identify interventions that minimize specific health risks in the most cost-effective manner.

Understanding the risks to health and well-being from climate change is particularly limited in

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low-and middle-income countries, delaying the uptake of health-relevant policies. For example, policies regarding adaptation to the increasing frequency and severity of heatwaves vary across jurisdictions and range from no policy, to education, or to having fully implemented comprehensive early warning and response plans. Even less attention has been given to policies relating to other health-related climate factors, such as infectious diseases and extreme weather events.

The inadequate response of public policy in addressing the health risks of climate change can be attributed to a limited understanding – by policy-makers and scientists – of the complex relationships between climate change and health. This is especially the case in local contexts, where local population vulnerabilities are of particular concern.

Epidemiologists are rarely involved in the assessment of adaptation and mitigation policies. It is epidemiologists that need to be empowered to gather data so that they can provide needed information on the potential health impacts of respective adaptation and mitigation strategies to policy-makers. A shift in thinking is required by policy- and decision- makers to make funding and resources available for epidemiologists, especially environmental epidemiologists, to conduct the science needed to inform policies to effectively protect and promote population health. Training and capacity building are also needed for the next generation of epidemiologists and other researchers to provide the approaches and data that will be required for rational decision-making in the coming decades.

Recommendations

Emphasizing the urgent need to strengthen and implement effective climate change mitigation and adaptation policies, supported by robust health evidence generated with the involvement of epidemiologists, the *International Joint Policy Committee of the Societies of Epidemiology* (IJPC-

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SE) and its member organization, the *International Society for Environmental Epidemiology* (ISEE), offer the following recommendations to improve the understanding of the population health risks that are related to climate change:

1 Both policymakers and researchers need to appreciate that health aspects of climate change require interdisciplinary research and practice at the international, national, and local levels;

2 Policymakers need to work with epidemiologists to identify areas of the policy cycle where epidemiologic methods and insights could contribute evidence for developing, implementing, and evaluating strategies and cost-effective health system interventions designed to increase individual and community resilience, taking into account vulnerabilities of local populations and local environment and health conditions;

3 Funding agencies should increase funding opportunities at international, national, and local levels in support of research into climate change impacts on health; epidemiologists and public health scientists should collaborate with researchers from other relevant disciplines in such initiatives;

4 Epidemiologists collaborating with researchers from other relevant disciplines should:

4.1 Assess the health consequences of climate change mitigation and adaptation policies and programs before implementation, using health impact assessment approaches;

4.2 Promote training and capacity building opportunities to enable epidemiologists to develop a comprehensive understanding of climate change challenges relevant to public health and to provide them with the skillsets necessary to design and conduct robust studies of the health risks of and possible responses to climate change;

4.3 Develop new and innovative epidemiologic approaches addressing climate change-

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related health risks;

4.4 Develop integrated surveillance and monitoring systems;

4.5 Incorporate uncertainties about future climate projections of health risks at the local, regional, and international levels;

4.6 Share data globally to develop a comprehensive understanding of health impacts that cannot be detected by single jurisdictions operating independently of one another.

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